

Inventions & Innovation Project Abstract

Low Head, Vortex Induced Vibrations River Energy Converter

Vortex Hydro Energy, LLC is developing a revolutionary technology to extract useful energy from low head/low power falling water resources. The technology, nicknamed VIVACE (Vortex Induced Vibrations Aquatic Clean Energy) Converter, is based on extensive studies of the physics and experimental measurements of Vortex Induced Vibrations (VIV) of cylinders. Dr. Michael Bernitsas, a professor of Naval Architecture and Marine Engineering at the University of Michigan and one of VIVACE's inventors, will lead the proposed project and serve as both Principal Investigator and Project Director.

This project is grounded in sound theory and time-tested methodology. VIVACE is based on the simple idea of maximizing and exploiting rather than spoiling and preventing Vortex Induced Vibrations (VIV). The phenomenon of VIV is well understood and causes tremendous damage in aero, civil, mechanical, marine, offshore, and nuclear applications. VIVACE harnesses this potentially destructive force to generate electricity; and according to calculations, the energy density is five times higher than the best competing technology, free flowing water turbines and water mills.

The primary objective of the project is to demonstrate a laboratory scale VIVACE converter in the wave tow tank at the University of Michigan Marine Hydrodynamics Laboratory. The initial test will be run with artificial damping to mimic an electrical generator. Once this test successfully shows uninterrupted nonlinear resonance with no "dead zones" over an expected range of velocities, a generator will be integrated with an off-the-shelf generator. Data will be gathered on the power take-off at different current speeds to assess efficiency. Then, key parameters will be adjusted to determine if the efficiency can be improved. Other proposed tests include extreme velocities and the impact of simulated river debris. The goal of these tests is to demonstrate that VIV and electrical generation can return after a disruption.

The environment benefits enabled by VIVACE are substantial. The improvements come in two key areas: eliminating the pollution from alternative electricity generating units and the maintaining of river ecosystems.



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